

THURSDAY, APRIL 9, 1908.

EXPERIMENTAL EMBRYOLOGY.

Experimental-Zoologie. Part i. Embryogenese. Eine Zusammenfassung der durch Versuche ermittelten Gesetzmässigkeiten tierischer Ei-Entwicklung (Befruchtung, Furchung, Organbildung). By Dr. Hans Przibram. Pp. 125; 16 plates. (Leipzig und Wien: Franz Deuticke, 1907.) Price 7 marks.

SOME three years ago Dr. Przibram, who is well known as a brilliant representative of the school of experimental zoologists, published "An Introduction to Experimental Morphology," which met with wide acceptance. The present volume is an expansion of part of the "Introduction," and forms an independent treatise on experimental embryology. It is to be followed by four other parts, dealing with regeneration, evolution, vitality, and function, and the whole will form a text-book of experimental zoology. If the subsequent parts are like the one before us in lucidity and thoroughness, Dr. Przibram will earn the gratitude of all interested in this dynamic aspect of the science; and who, nowadays, can afford to stand aloof? The present volume discusses, in the light of experimental results, the processes of fertilisation, cleavage, gastrulation, and differentiation, and sums up in an analysis of the influence of chemical stimuli, moisture, density of the medium, pressure, gravity, electricity and magnetism, light and heat. There is a copious and carefully executed bibliography, and the figures in the plates, which are partly compiled and partly original, are very clear and interesting.

The author discusses large and difficult problems, in regard to which there is room for considerable difference of opinion, but his treatment of these is thoroughly objective and undogmatic. We cannot do better than give some samples of his general conclusions. Fertilisation, whether artificial or spermatric, brings about a withdrawal of water from the egg; this accelerates the vital processes which are going on of themselves, and the egg passes from a relatively resting state to progressive development. The unfertilised egg has an organisation of different kinds of substances which guarantees the forthcoming manifoldness. The direction of the first cleavage is in a plane at right angles to the axis of the first karyokinetic spindle, and the position of the latter is determined by the geometrical architecture of the egg and the fertilisation-meridian (on which the spermatozoa enter).

In regard to the familiar sequence of centrosome division, astrosphere formation, nuclear division, cytoplasmic division, and perhaps also the progressive differentiation of the blastomeres, we must not suppose that any particular link in the chain is the necessary cause of the next link; we must rather suppose that a common cause evokes them in succession, and that their cooperation secures the typical development. Provisionally we may say that the common cause of the mitotic phenomena lies in a localised change in

the fluidity of the enchylemma and the associated rearrangement of a monocentric into a dicentric surface-tension-system. The second and subsequent cleavages depend on a rhythmic recurrence of the metabolic relations involved in the first cleavage (the entrance of oxygen conditioning the continuance of the metabolism, the intensity of which changes with the changes in the proportion of absorbent surface to assimilatory volume), and on the presence of antagonistic substances, which partly prevent the complete separation of the blastomeres (calcium), and partly secure a certain cohesion (sodium).

The arrangement of the blastomeres depends on Plateau's law of the smallest surface, modified by differences in the consistence of different parts of the ovum, which are also responsible for the different sizes of the blastomeres (Balfour's law). Blastulation and gastrulation depend on chemotactic influences, which are set at work by metabolic processes, and admit not only of passive-mechanical displacements, but of active migrations as well. In different zones of the egg there are chemically different substances which normally condition the differentiation of the various organs. Thus the blastomeres acquire a prospective value. If there is no rearrangement of material, an artificial fractioning of the egg is followed by a self-differentiation of the fragments, so that semi-embryos, quarto-embryos, and so on, result; but if a re-arrangement is effected, restoring the *status quo* of the intact ovum, then dwarf complete embryos result. The prospective potency of such blastomeres is greater than their prospective value. The influence of external factors is subsidiary when compared with the internal formative factors, and animal embryogenesis may be described as an almost quite perfect self-differentiation in Roux's sense.

We have stated these general conclusions because of their great interest, but it must be noted that the bulk of the book is a terse statement of concrete facts from which the expert student may draw his own conclusions, and at this stage that is well.

J. A. T.

GEOLOGICAL REVIVALISM.

Geologische Prinzipienfragen. By E. Reyer. Pp. x+202. (Leipzig: W. Engelmann, 1907.) Price 4.40 marks.

THIS work recalls, with renewed interest, a remarkable paper by Mr. Reyer on the Schlossberg of Teplitz, to which the attention of the present writer was directed by Prof. Judd nearly thirty years ago. Are not some of Reyer's models still preserved in London, and have not these models, and respectful visits to the Schlossberg itself, influenced many of us in our attempts at teaching ever since? Mr. Reyer, however, when he went further into the theory of the formation of mountains by the protrusion of masses from below and the gliding of the superincumbent layers, found the geological world opposed to him, and he turned, as he now informs us (p. v.), to fields of sociological activity. Yet he should surely be satisfied with the numerous references to his

A A

work, especially on volcanic questions, in Zittel's "History of Geology" or Geikie's monumental "Text-book." Ampferer's recent exposition of "Unterstromung," moreover, as a cause of mountain-crumpling comes very near in many of its details, though not in its foundations, to Reyer's theory of superficial "Stromung" (see *NATURE*, vol. lxxvi., 1907, p. 423). Though Ampferer quotes very few authorities, it seems likely that Reyer's views are still fructifying, even if they bear forbidden fruit. At any rate, we may welcome his return to the arena at a time when no champion can assert that his own views on mountain-building have satisfied all known conditions.

Mr. Reyer himself, in this clearly-written treatise, proposes to leave his statements and arguments unburdened by a bibliography. The numerous illustrative diagrams suggest in most cases drawings made from models, and some of them represent the results of experiments performed in plastic materials. There is a freshness of exposition that brings home to us many facts that are familiar, but which are often liable to be passed over without adequate consideration. The exposition itself is, if we may say so, diagrammatic. The author points out very early how delta-deposits slide upon the rocks beneath them, and how a loose valley-side moves out towards the river, which carries away the material, and thus renders the land-flow less apparent. From p. 52 onward we read of massive extrusions of material from the molten interior of the earth, and we remember the sliding of the deltas when we are asked to picture successive extrusions as lifting the crust above them and allowing of a lateral slip of the ruptured sedimentary layers. The great difference between these postulated extrusions and our common notions of intrusive bodies appears to lie in their long-continued and successive character, whereby a later igneous mass causes a previous one to bulge up and swell out as a coat, through which the later mass may break. It is urged that if this occurs below a deep ocean, the extruded matter may become as crystalline as granite, and subsequent sediments may be laid down on it with a false appearance of having been invaded.

All this should probably be kept in mind, but we doubt if the average field-observer has been so often misled as Mr. Reyer would wish us to believe. He opposes the idea of the differentiation of a common igneous magma (p. 61), since acid and basic magmas must have separated early in the history of a cooling globe, and massive protrusions are likely to mix them up again, so as to produce the phenomena observed. Such protrusions or extrusions are held to be sufficient to explain the existence of infolds of sediments between adjacent igneous masses (pp. 69 and 155); and an admitted revival of the "crater of elevation" theory appears on p. 73. There is much in the book that is in pleasant accord with the views consistently maintained in Britain in regard to the relations of various types of igneous rock; and the principle of successive extrusions (or may we say intrusions?) has been adopted, to mention only two examples, by Prof. Sollas for

the Leinster Chain and by Dr. Harker for the gabbros of the Cuillin Hills.

Mr. Reyer's views cannot fail to make us think more carefully, and we trust that his book will be widely read by those who have to interpret the history of great regions of the crust. We may hereafter be grateful to him for maintaining the theory of gravitational gliding (pp. 142, 147, &c.) as opposed to the crumpling of strata by lateral thrust against the influence of gravitation. In this respect he has relighted a very ancient candle, which burnt brightly in Scrope's hands in 1825 ("Considerations on Volcanos," pp. 201-2). It will now, in all probability never be entirely put out. GRENVILLE A. J. COLE.

HYDRAULICS.

Hydraulics. By F. C. Lea. Pp. xii+536. (London: Edward Arnold, 1908.) Price 18s. net.

WHATEVER may be the extent to which the science of hydraulics was neglected during the century which elapsed between the theoretical researches of Bernouilli and the practical applications of Armstrong, it cannot be urged that there is any lack of attention to the subject at the present time, if one be permitted to judge from the number of text-books which have appeared within recent years, and even within the last few months. So striking an output must surely be fraught with great potentialities.

The science of hydraulics has a field which is somewhat vague and ill-defined, and is of greater or less extent according to the views of different writers. Originally, the definition of the term only covered a reference to the laws which governed the motion of fluids in pipes and water-courses. Then it was extended to include the use of water for motive purposes, and the means and appliances by which that end was achieved. Other developments have followed, and now it is rare to find two text-books covering even approximately the same ground, or agreeing in respect of either limits or order of treatment. We are acquainted with one treatise which includes within its purview the principles of lubrication; with another which regards what is commonly differentiated as the science of pneumatics as a constituent section; with a third which ignores the motion of bodies in fluids; and so on.

The range of the treatise under consideration, though not so extreme as in some cases, is nevertheless exceedingly comprehensive, and it may be added that the treatment is very complete. In view of the license to which allusion has just been made, we do not presume to offer any criticism on the propriety of presenting the elementary principles of hydrostatics as an introduction to the subject; we ourselves should hardly have thought of referring to a text-book on hydraulics for them. No doubt it is useful for the student to have his memory refreshed on fundamentals, though he may not unreasonably be supposed to have acquired a competent knowledge of them elsewhere. Still, there they are for consultation, if required, and they form a not inapt introduction.